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(54) Title: SYNCHRONIZING A CLIENT WITH A MEDIA SIGNAL

(57) Abstract: A method of synchronizing a client with a media signal includes receiving one or more actions corresponding to the media singal, determining an application for handling the actions, and causing the determined application to handle the actions.

SYNCHRONIZING A CLIENT WITH A MEDIA SIGNAL

Background

The Internet and traditional radio and TV broadcasts both offer users/viewers access to a wide variety of information. Both mediums, generally, have different strengths. For example, the Internet enables users to view the content offered by a site at their own pace. Additionally, many sites provide a degree of inter-activity absent from traditional TV and radio broadcasts. For example, a web-page may solicit user input via forms or "applets" and respond accordingly. While Internet sites have greatly improved the quality and speed of network video transmission, traditional broadcasts generally retain the upper hand in image and sound quality.

Summary

In general, in one aspect, the invention features a method of synchronizing a client with a media signal. The method includes receiving one or more actions corresponding to the media signal, determining an application for handling the actions, and causing the determined application to handle at the actions.

Embodiments may include one or more of the following features. The media signal may be an audio signal and/or a video signal. Determining an application can include parsing action information. For example, parsing action information can include determining if the action information corresponds to a URI (Universal Resource Indicator) or a command. For actions including a URI, the method can include navigating a browser to the URI.

The method may further include prompting a user before causing the determined application to handle the action. The method may also include queuing the action. The action may include an indication of when the determined application should handle the action (e.g., an SMPTE (Society of Motion Pictures and Television Engineers) time-code). The actions may be received from a server.

The method may also include receiving criteria associated with the action and evaluating the criteria. The criteria may include one or more user characteristics (e.g., age, location, and gender).

In general, in another aspect, the invention features a computer program product, disposed on a computer readable medium, the computer program for synchronizing a client with a media signal. The program includes instructions for causing a processor to receive one or more actions corresponding to the

media signal, determine an application for handling at least one of the one or more received actions, and cause the determined application to handle at least one of the one or more received actions.

In general, in another aspect, the invention features a method of synchronizing one or more clients with a media signal. The method includes receiving information identifying an action corresponding to the media signal, receiving information identifying criteria for the action, and transmitting the action and criteria toward the one or more clients.

Embodiments may include one or more of the following. The action includes an identification of a time for processing the action and, for example, a URI or some application command or data. Transmitting the action and criteria toward one or more clients may include transmitting the action and criteria to a server and determining at the server, based on the action criteria, whether to transmit the action to a client. Such a determination may be done based on user characteristics associated with the client. In some embodiments, a client receives the action and determines, based on the action criteria, whether to execute the action.

In general, in another aspect, the invention features a method of synchronizing a client with a media signal. The method includes receiving one or more actions corresponding to

the media signal, the actions including an indication of a time to execute each action. The method also includes determining a delay time for the action and handling the action in accordance with the delay time.

Embodiments may include one or more of the following features. Determining a delay time may be based on the location of a client and/or on a broadcast medium used to transmit the media signal to a household of the client.

Advantages will become apparent in view of the following description, including the figures and the claims.

Brief Description of the Drawings

FIGs. 1A and 1B are diagrams of systems for synchronizing a client with a media signal.

FIG. 2 is a flow-chart of a process for transmitting actions to a server.

FIG. 3 is a screenshot of a user interface for identifying actions corresponding to a media signal.

FIG. 4 is a flow-chart of a process for transmitting actions to clients.

FIG. 5 is a diagram of a client including instructions for processing actions.

FIG. 6 is a flow-chart of a process for receiving and processing actions.

Detailed Description

FIG. 1A shows an example of a system 100 for synchronizing actions performed by computer 106 with a TV 104 or radio show. For example, as a station 108 broadcasts a TV show (e.g., via airways, cable, or satellite), a computer 106 web-browser may automatically navigate to Internet web-sites corresponding to the TV show content. That is, when the TV show mentions the U.S. Soccer Team, a user's computer may automatically navigate a web-browser to a URI (Universal Resource Indicator) of "www.soccer.com/usa/schedule". Similarly, when the TV show mentions a particular player, a user's web-browser may automatically navigate to a URI with a detailed biography. The system 100 can support a wide variety of applications. For example, inter-active web-pages may quiz and provide feedback to students viewing a broadcast school lesson.

Though the system 100 can provide Internet access that is synchronized with a media signal, the system 100 need not be limited to Internet navigation. For example, the system 100 can feature actions that transmit data and/or invoke different client 106 applications other than a browser. For example, actions may cause a client 106 to download and install protection software when a TV program reports the latest computer virus.

In addition to synchronization of clients 106 with a signal, the system 100 can also tailor the actions performed by the clients 106, for example, based on user characteristics and/or preferences. That is, an action may cause a computer to present an adult with an option to charge an item shown on TV to their credit card, but not present this option to a child. To provide this feature, the server 112 and/or client 106 may store user characteristics such as an address, gender, age, and so forth.

The system 100 can be implemented in a variety of ways. For example, the system 100 of FIG. 1A includes a control computer 110 that enables an operator to define actions corresponding to a media signal 114 (e.g., TV or radio signal). The system 100 also includes a server 112 that receives actions from the control computer 110 and transmits (e.g., multicasts) the actions to clients 106 in households 102 viewing or listening to a particular broadcast.

In an alternate implementation shown in FIG. 1B, the control computer 110 can embed actions in the signal itself, for example, in a VBI (Vertical Blanking Interval) of a video signal. Thus, instead of network transmission of the actions from the control computer 110 to the server 112, the server 112 can monitor the signal as broadcast, extract the actions, and, again, transmit them to the corresponding client 106.

Additionally, clients 106 can monitor a broadcast or other media signal to monitor for actions without the server 112.

Though shown as personal computers 106 in FIG. 1A and 1B, client software and/or hardware can reside in a wide variety of network devices such as network appliances, handheld PCs, PDAs (Personal Digital Assistants), game consoles, Internet phones, WAP (Wireless Access Protocol) devices, set-top boxes, ReplayTV®, TiVo®, and so forth. Additionally, though FIG. 1 shows a TV 104 as an example of an a device that presents a media signal, the media signal may also be presented by the same device running the client software. For example, the media signal may be streaming audio or video carried across the Internet to a client computer. Further, while shown as being received from a remote location, the media signal may come from a local source. For example, a VCR may output a media signal to for display and correlation with different actions downloaded from a server or from within the VCR signal.

As shown in FIG. 2, an operator can use the control computer 110 to define 205 actions and specify how the actions should synchronize with the media signal (e.g., when the actions should occur relative to the start of the signal). Each action defines some operation the client should perform. For example, an action may include a command line identifying an application (e.g., "run virus_install.exe"), a URI (e.g., www.tvshow.com)

specifying a web-site a browser should visit, data representing the real or virtual coordinates of an object or person of a TV show for use by a game application, and so forth. The control computer 110 can, in turn, transmit 204 the actions over a secure (e.g., encrypted) connection (e.g., a TCP/IP (Transmission Control Protocol/Internet Protocol) connection) established 202 with the server 112. This encryption may be based upon a security key. The key can be changed at the administrative level. Once the key is decoded by the server, an action can be queued. The system may also employee an encryption key at the end user level. As an additional measure of security, the system can also make use of firewall security at the server/control level as well as the client level.

The control computer 110 can offer a variety of different techniques for defining actions. For example, the control computer 110 can enable an operator to define actions in real-time. That is, as a signal broadcasts, an operator can define actions for the broadcast and immediately send them to the server 112 for transmission to clients 106. This can enable an operator to synchronize clients 106 during live broadcasts. The same technique may also enable an operator to specify transmission delays. For example, an operator may define an action and specify that it not be transmitted or executed by the clients 106 for a period of *n*-seconds.

The user interface techniques described above feature an operator sitting and viewing the broadcast in real-time and preparing appropriate client computer actions. While the control computer 110 may ease the demands on an operator, for example, by providing previously defined actions for selection, the process of defining actions in real-time may require some dexterity and quick-wittedness on the part of the operator to keep up with the on-going broadcast. Thus, the control computer 110 may provide a user interface that enables the operator to define actions for pre-recorded material at his or her leisure.

Thus, the control computer 110 may provide a user interface that enables an operator to define an action and associate the action with a particular time-code. For example, video typically includes embedded SMPTE (Society of Motion Picture and Television Engineers) time-codes identifying each video frame. Thus, the user interface can enable an operator to associate an action with a particular time-code. For example, an action of "Get Smart: 000100 : www.getsmart.com/episode12" may define an action that causes a client computer's 106 web-browser to visit the "www.getsmart.com" web-site at the one-hundredth frame of Episode 12 of "Get Smart". The control computer 110 may use other time-codes other than SMPTE (e.g., NNTP time-codes). Additionally, the operator may simply enter a time offset for the action (e.g., one minute after broadcast begins).

Again, instead of, or in addition to, transmitting actions to a server 112 via a network connection, the control computer 110 may embed the actions within a media signal such as the video blanking interval (VBI) of a video. In such embodiments, a server 112 can monitor the media signal, extract action definitions, and transmit the actions to clients 106. Additionally, in implementations that embed the actions in the video and/or audio signal, a system 100 need not use a server 112 at all. For example, client computers 106 can monitor media signals received by the household 102 TVs 104 and process the embedded actions.

FIG. 3 illustrates an example of a user interface 300 presented to an operator of a control computer 110. As shown, the interface 300 enables an operator to define actions 302 for a particular broadcast. The action can include a URI, an application program command and parameters, and/or other instructions or data for transmission to the clients 106. The action can also include synchronization information (e.g., a date, time, and/or frame 110 of an action). The interface 300 may also enable an operator to define whether the action is performed automatically or whether a user at the client computer 106 is prompted before execution. The interface 300 may further enable an operator to define criteria that must be satisfied for performance of the action. For example, the operator may

construct a Boolean expression of user characteristics (e.g., (gender = male) AND (age > 35)). The operator may define multiple actions for the same signal time-code with different actions having different criteria. This enables the operator to tailor the behavior of client computers 110 for different classes of users. As shown, the interface 300 also includes a list 304 of previously defined actions for selection and a list 306 of actions already assigned to the broadcast.

FIG. 4 shows a process 400 that a server 112 can use to transmit 408 actions received 402 from a control computer 110 or detected in a signal (e.g., the VBI portion of a video). After receiving the actions, the server 112 can log the actions. For example, the server 110 may dynamically add a description of broadcast actions to an HTML (HyperText Markup Language) or XML (eXtensible Markup Language) page listing actions for a particular show or broadcast. Users and contributors can access the logs to view actions for a particular broadcast long after the show has aired.

Before and during a broadcast, the server 110 may receive registration requests from different system 100 users. Registration identifies a broadcast the user is viewing and, potentially, the IP (Internet Protocol) address of their client. Additionally, for new members, registration may involve providing demographic data such as an address, age, gender,

income, and so forth. This data may be stored by the server 110 to tailor the actions delivered to a user's client 106. For existing members, registration may involve entering a user name so the server 110 can retrieve the previously stored demographic data for the user.

Registration and other interaction with the server 112 may occur via the Internet (e.g., a login web-page, a preferences web-page and so forth) or via a telephone voice response system that enables a user to customize and select different services transmitted to the client.

During broadcast of a TV or radio program, the server 112 sends actions for the broadcast to clients 106 identified as viewing the show. For example, the server 112 can multicast the actions using UDP (User Datagram Protocol) or other protocols. Again, the server 112 may select actions for transmission based on user demographic data. The server 112 may handle timing issues by transmitting actions at the specified times. Alternatively, the server 112 may include synchronization information in the action and leave it to the client 106 to process the action at the designated time.

The same show may be broadcast at slightly different times. For example, a satellite transmission generally lags cable transmission by tens of seconds. Additionally, different geographic locations broadcast at different times. The server

112 can offset 408 transmission of actions based on the geographic location of a user (e.g., based on the user's zip code) and/or transmission sources (e.g., cable or satellite).

Communication between the clients 106 and server 110 need not be one way. That is, the clients 106 may send data to the server 110, for example, using TCP/IP. This enables the server 110 to monitor user behavior and can enable the server to select actions based on prior user behavior.

FIG. 5 shows an example of a client 106. As shown, the client 106 includes an operating system 504 (e.g., Microsoft® Windows 2000®) and one or more applications 502 (e.g., Microsoft® Explorer® and Microsoft® Word®). The client 106 also includes instructions 500 for processing actions. As shown, the processing instructions 500 can invoke other applications and can even make operating system 504 calls.

FIG. 6 illustrates a process 600 the instructions (500 of FIG. 5) may implement. As shown, the process 600 may include registering the user with a server 602, for example, by navigating a browser to a log-in web-site associated with the server. Registering enables the client to identify a program being viewed or heard. Of course, a user need not actually be viewing or listening to a program.

Thereafter, the client may receive a stream of one or more actions 604 corresponding to the identified program as the

program broadcast progresses. The client determines an application for the action. For example, the client may parse information included in the action to identify whether an action includes a URI. If such parsing succeeds, the client can pass the URI to a browser. Alternatively, the client can look for names of applications and/or keyword such as "run" that indicate what operation the client should perform in response to the action (e.g., which application should handle the action).

The system(s) described above can use a variety of architectures. For example, many features provided by the server can instead be provided by the client and vice-versa. For example, instead of selection by the server 110, the server 110 may transmit action criteria for evaluation 606 by the client. Additionally, either the server 110 or client 106 may specify that the action be queued 610 or executed 612 upon receipt or arrival of a specified time. Further, either the server 110 or client 106 may request that the client prompt a user before executing an action. This can enable, for example, a user to finish reading information at one web-site before moving on to another.

Implementations

The techniques described herein are not limited to any particular hardware or software configuration; they may find

applicability in any computing or processing environment. The techniques may be implemented in hardware or software, or a combination of the two. Preferably, the techniques are implemented in computer programs executing on programmable computers that each include a processor, a storage medium readable by the processor (including volatile and non-volatile memory and/or storage elements), at least one input device, and one or more output devices.

Each program is preferably implemented in high level procedural or object oriented programming language to communicate with a computer system. However, the programs can be implemented in assembly or machine language, if desired. In any case the language may be compiled or interpreted language.

Each such computer program is preferably stored on a storage medium or device (e.g., CD-ROM, hard disk, or magnetic disk) that is readable by a general or special purpose programmable computer for configuring and operating the computer when the storage medium or device is read by the computer to perform the procedures described herein. The system may also be considered to be implemented as a computer-readable storage medium, configured with a computer program, where the storage medium so configured causes a computer to operate in a specific and predefined manner.

Other embodiments are within the scope of the following claims.

What is claimed is:

1. A method of synchronizing a client with a media signal, the method comprising:

receiving one or more actions corresponding to the media signal;

determining an application for handling at least one of the one or more received actions; and

causing the determined application to handle at least one of the one or more received actions.

2. The method of claim 1, wherein the media signal comprises at least one of the following: an audio signal and a video signal.

3. The method of claim 1, wherein determining an application comprises parsing action information.

4. The method of claim 3, wherein parsing action information comprises determining if the action information corresponds to a URI (Universal Resource Indicator).

5. The method of claim 3, wherein parsing action information comprises determining if the action information corresponds to a command.

6. The method of claim 1, wherein causing the determined application to handle at least one of the actions comprises causing an Internet browser to navigate to a URI specified in the action.

7. The method of claim 1, further comprising prompting a user before causing the determined application to handle the action.

8. The method of claim 1, further comprising queuing the action.

9. The method of claim 1, wherein the action comprises at least one of the following: a URI and an application command.

10. The method of claim 9, wherein the action comprises an indication of when the determined application should handle the action.

11. The method of claim 10, wherein the indication comprises a SMPTE (Society of Motion Pictures and Television Engineers) time-code.

12. The method of claim 1, wherein receiving the at least one actions comprises receiving the at least one actions from a server.

13. The method of claim 1, further comprising

receiving criteria associated with the action; and

evaluating the criteria.

14. The method of claim 13, wherein the criteria comprises one or more user characteristics.

15. The method of claim 14, wherein the user characteristics comprises at least one of the following: age, location, and gender.

16. A computer program product, disposed on a computer readable medium, the computer program for synchronizing a client with a media signal, the program comprising instructions for causing a processor to:

receive one or more actions corresponding to the media signal;

determine an application for handling at least one of the one or more received actions; and

cause the determined application to handle at least one of the one or more received actions.

18. A method of synchronizing one or more clients with a media signal, the method comprising:

receiving information identifying an action corresponding to the media signal;

receiving information identifying criteria for the action;

transmitting the action and criteria toward the one or more clients.

19. The method of claim 18, wherein the action comprises identification of a time for processing the action and at least one of the following: a URI and an application command.

20. The method of claim 18, wherein transmitting the action and criteria toward one or more clients comprises transmitting the action and criteria to a server.

21. The method of claim 20, further comprising

determining at the server, based on the action criteria, whether to transmit the action to a client.

22. The method of claim 21, wherein determining comprises determining based on user characteristics associated with the client.

23. The method of claim 22, wherein the user characteristics comprise one or more of the following: age, gender, and location.

24. The method of claim 18, further comprising

receiving the action and criteria at a client; and

determining at the client, based on the action criteria, whether to execute the action.

25. The method of claim 24, wherein determining comprises determining based on user characteristics.

26. The method of claim 25, wherein the user characteristics comprise one or more of the following: age, gender, and location.

27. A method of synchronizing a client with a media signal, the method comprising:

receiving one or more actions corresponding to the media signal, the actions including an indication of a time to execute each action;

determining a delay time for the action; and

handling the action in accordance with the delay time.

28. The method of claim 27, wherein determining a delay time comprises determining a delay time based on the location of a client.

29. The method of claim 27, wherein determining a delay time comprises determining a delay time based on a broadcast medium used to transmit the media signal to a household of the client.

30. The method of claim 27, wherein handling the action comprises determining when to transmit the action from a server to the client.

31. The method of claim 27, wherein handling the action comprises determining when to execute the action at the client.

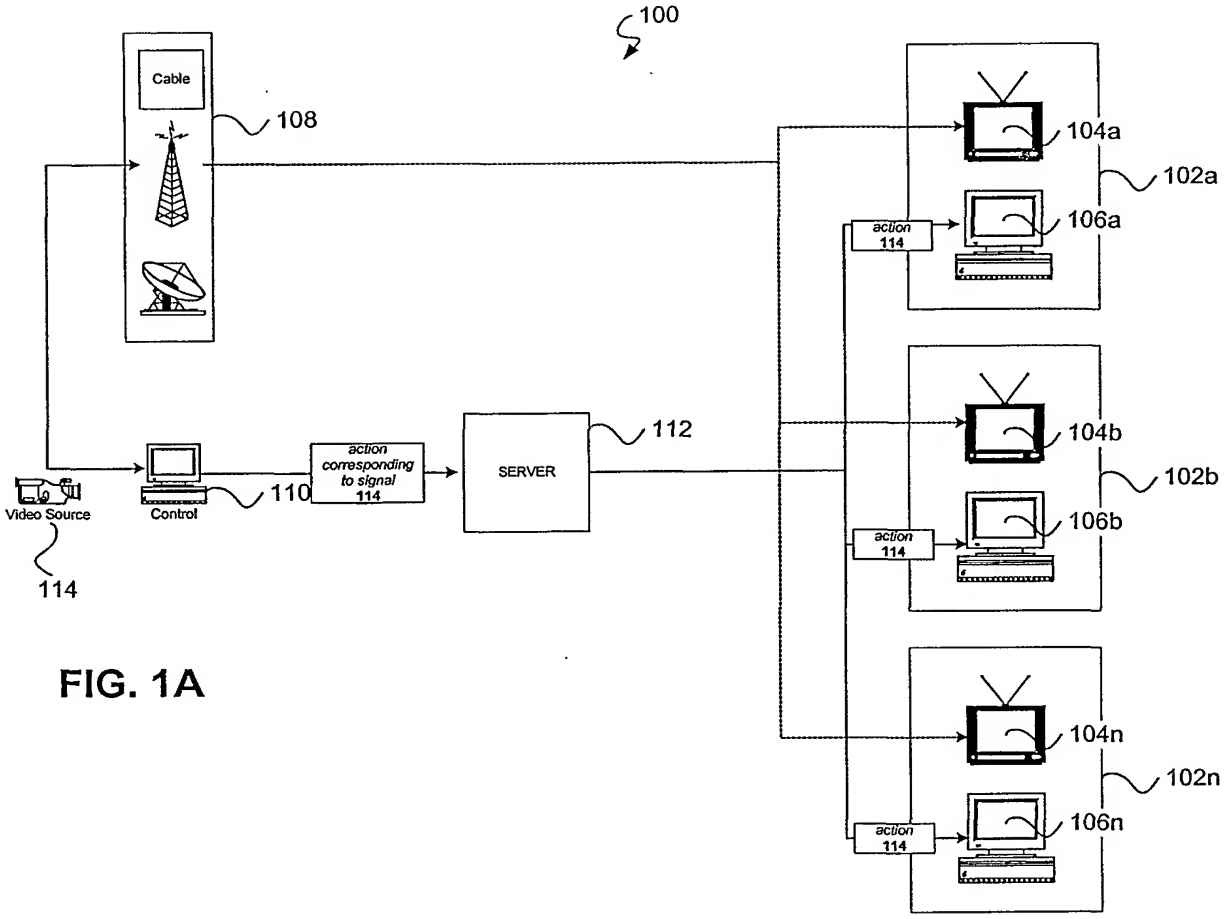

100
Cable
108
104a
102a
106a
action 114
104b
102b
106b
action 114
112
SERVER
action corresponding to signal 114
Video Source
Control
110
114
104n
102n
106n
action 114

FIG. 1A

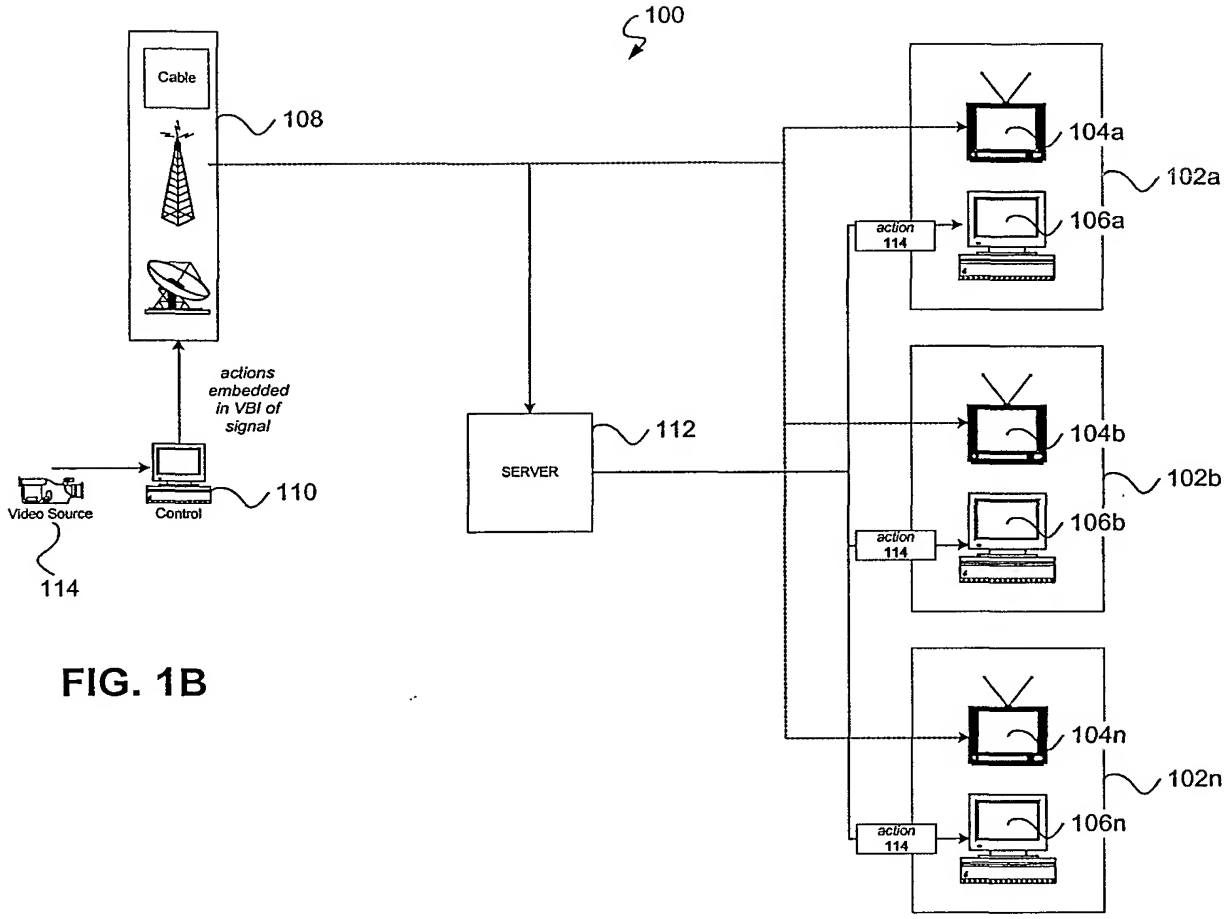

100
Cable
108
actions embedded in VBI of signal
Video Source
Control
110
114
SERVER
112
104a
102a
106a
action 114
104b
102b
106b
action 114
104n
102n
106n
action 114

FIG. 1B

FIG. 2

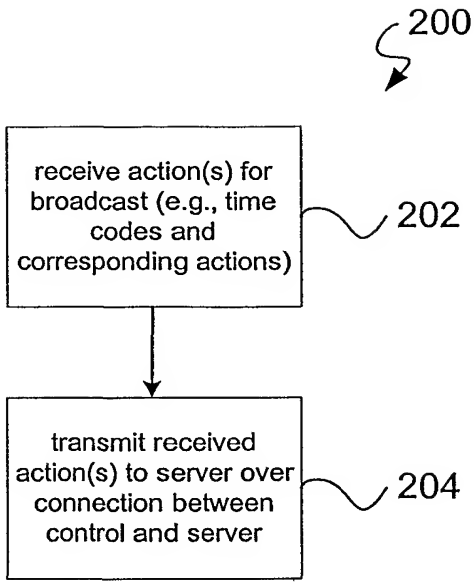

200
receive action(s) for broadcast (e.g., time codes and corresponding actions)
202
transmit received action(s) to server over connection between control and server
204

FIG. 3

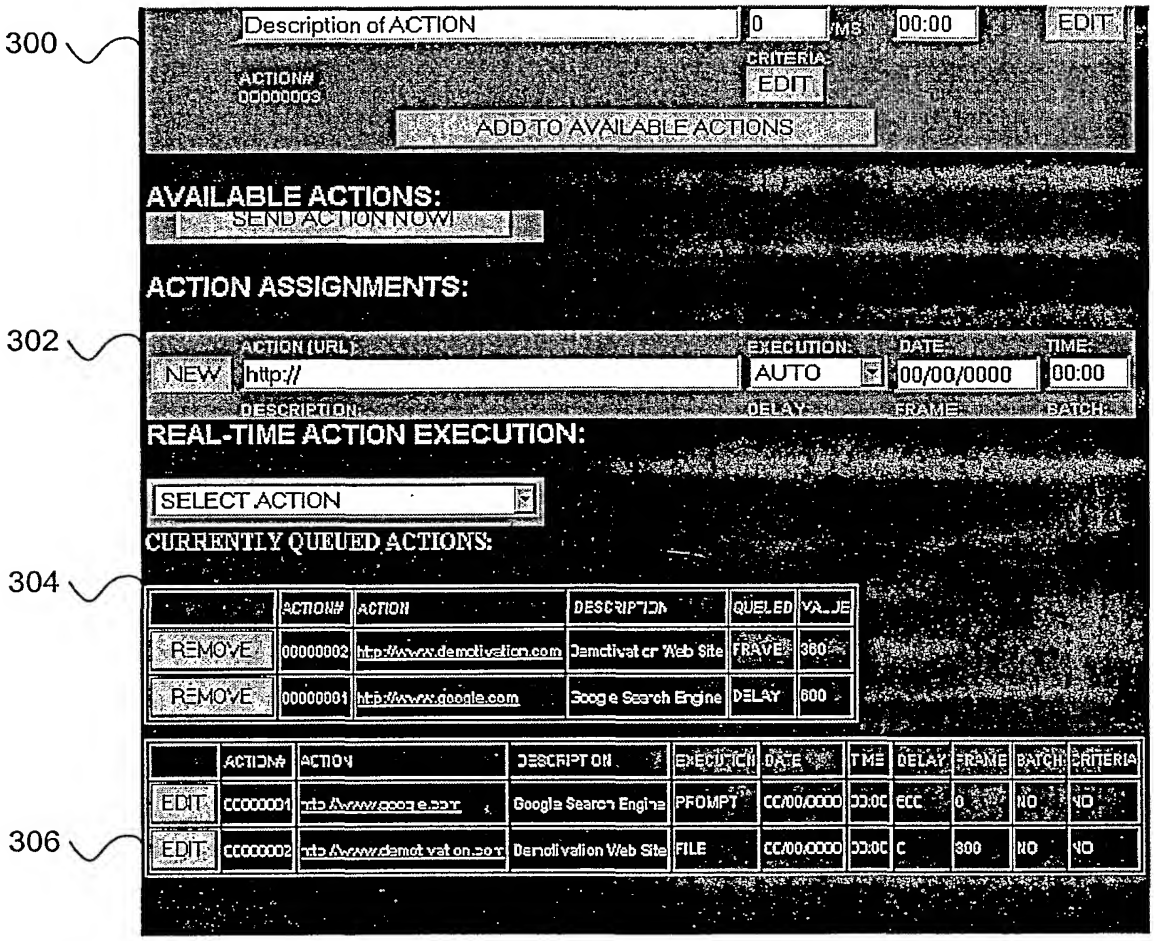

300
Description of ACTION
0
MS
00:00
EDIT
CRITERIA:
EDIT
ACTION#
00000003
ADD TO AVAILABLE ACTIONS
AVAILABLE ACTIONS:
SEND ACTION NOW!
ACTION ASSIGNMENTS:
302
ACTION (URL)
EXECUTION:
DATE:
TIME:
NEW
http://
AUTO
00/00/0000
00:00
DESCRIPTION:
DELAY:
FRAME:
BATCH:
REAL-TIME ACTION EXECUTION:
SELECT ACTION
CURRENTLY QUEUED ACTIONS:
304
ACTION#
ACTION
DESCRIPTION
QUELED
VALUE
REMOVE
00000002
http://www.demotivation.com
Demotivator Web Site
FRAME
380
REMOVE
00000001
http://www.google.com
Google Search Engine
DELAY
600
ACTION#
ACTION
DESCRIPTION
EXECUTION
DATE
TIME
DELAY
FRAME
BATCH
CRITERIA
EDIT
CC000001
http://www.google.com
Google Search Engine
PROMPT
CC/00/0000
00:00
ECC
0
NO
NO
306
EDIT
CC000002
http://www.demotivation.com
Demotivation Web Site
FILE
CC/00/0000
00:00
C
300
NO
NO

FIG. 4

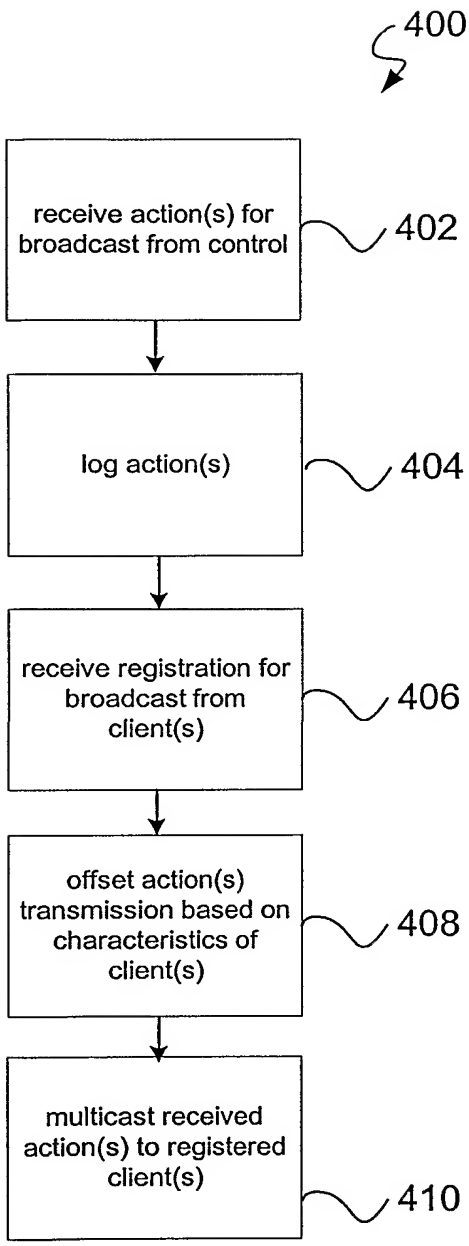

400
receive action(s) for broadcast from control
402
log action(s)
404
receive registration for broadcast from client(s)
406
offset action(s) transmission based on characteristics of client(s)
408
multicast received action(s) to registered client(s)
410

FIG. 5

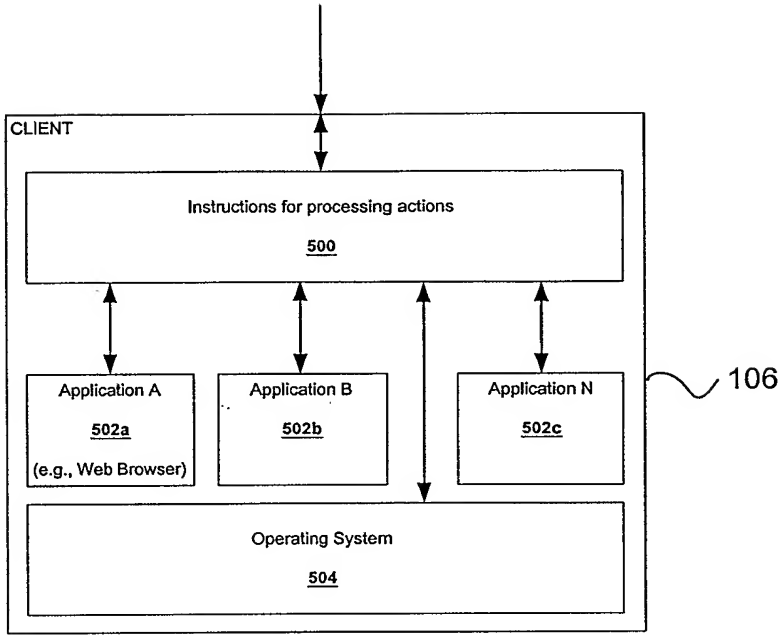
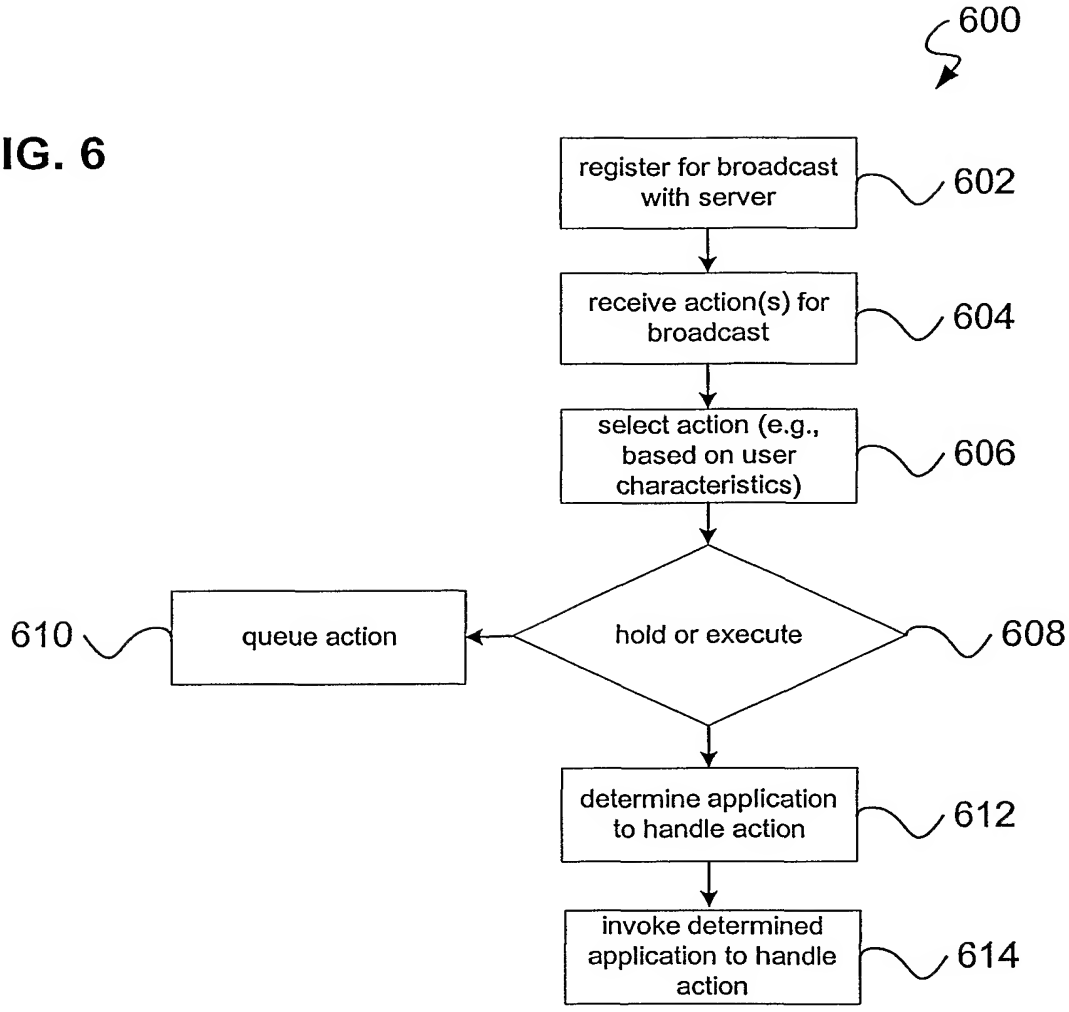

CLIENT
Instructions for processing actions
500
Application A
502a
(e.g., Web Browser)
Application B
502b
Application N
502c
Operating System
504
106

FIG. 6


600
register for broadcast with server
602
receive action(s) for broadcast
604
select action (e.g., based on user characteristics)
606
hold or execute
608
610
queue action
determine application to handle action
612
invoke determined application to handle action
614